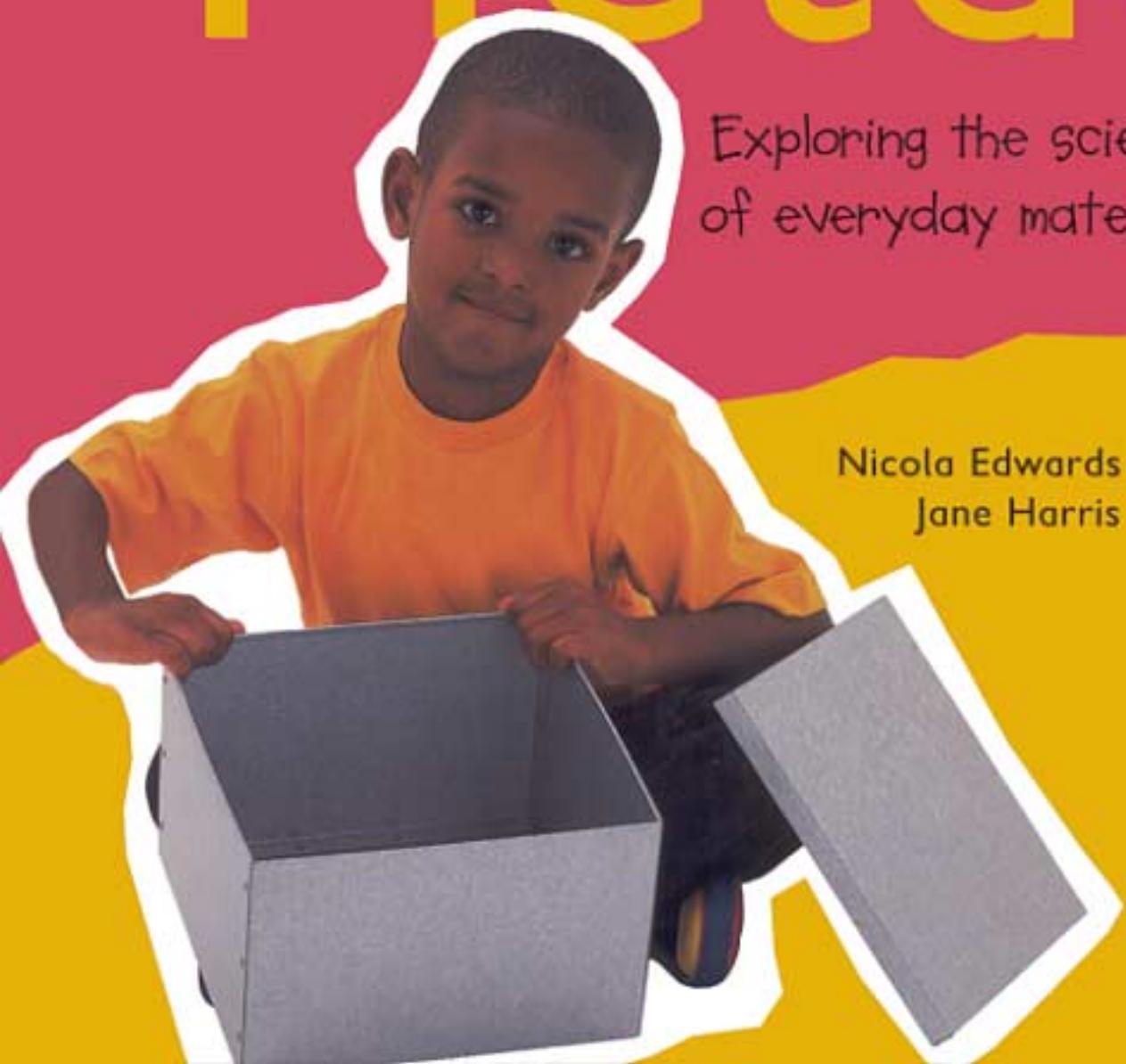


Science Explorers

# Metal

Exploring the science  
of everyday materials

Nicola Edwards and  
Jane Harris



# Metal

Electronic book published by [ipicturebooks.com](http://www.ipicturebooks.com)

24 W. 25th St.  
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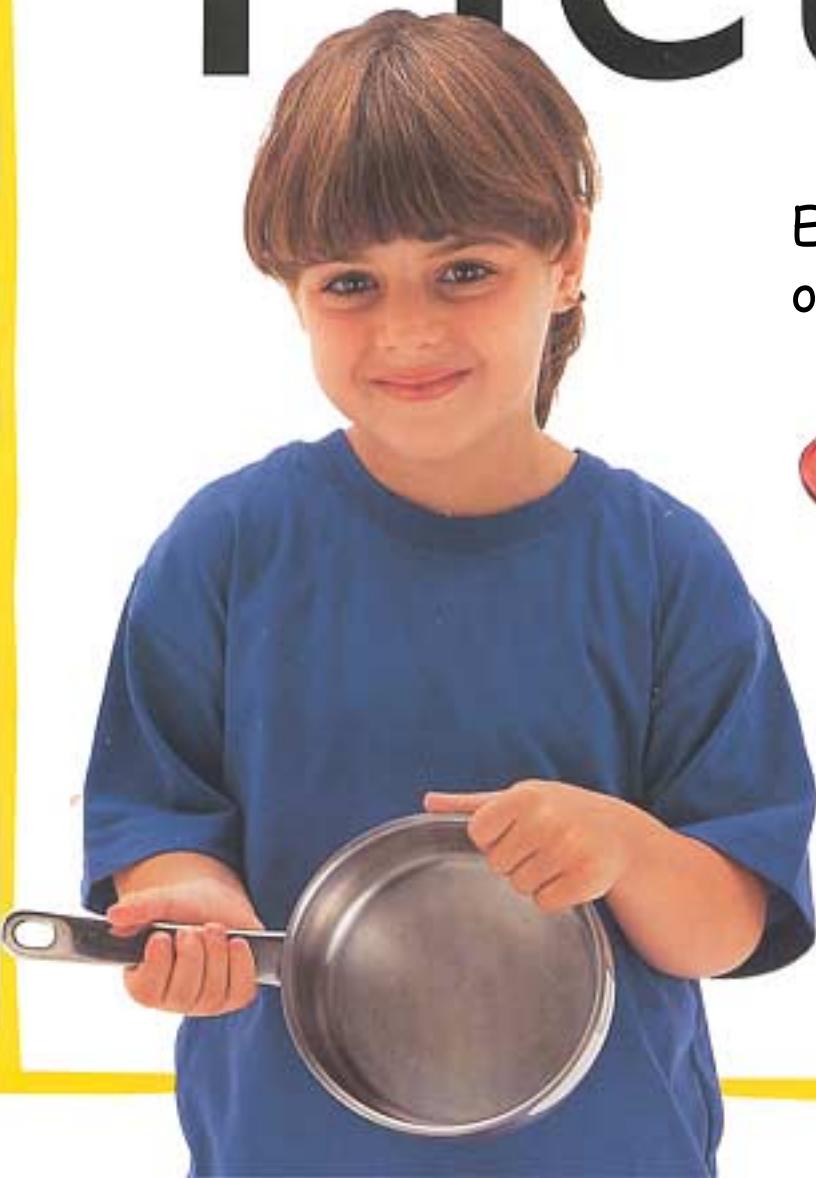
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e-ISBN 1-59019-856-5  
Library of Congress Cataloging-in-Publication Data is available  
ISBN 0-7136-5345-0

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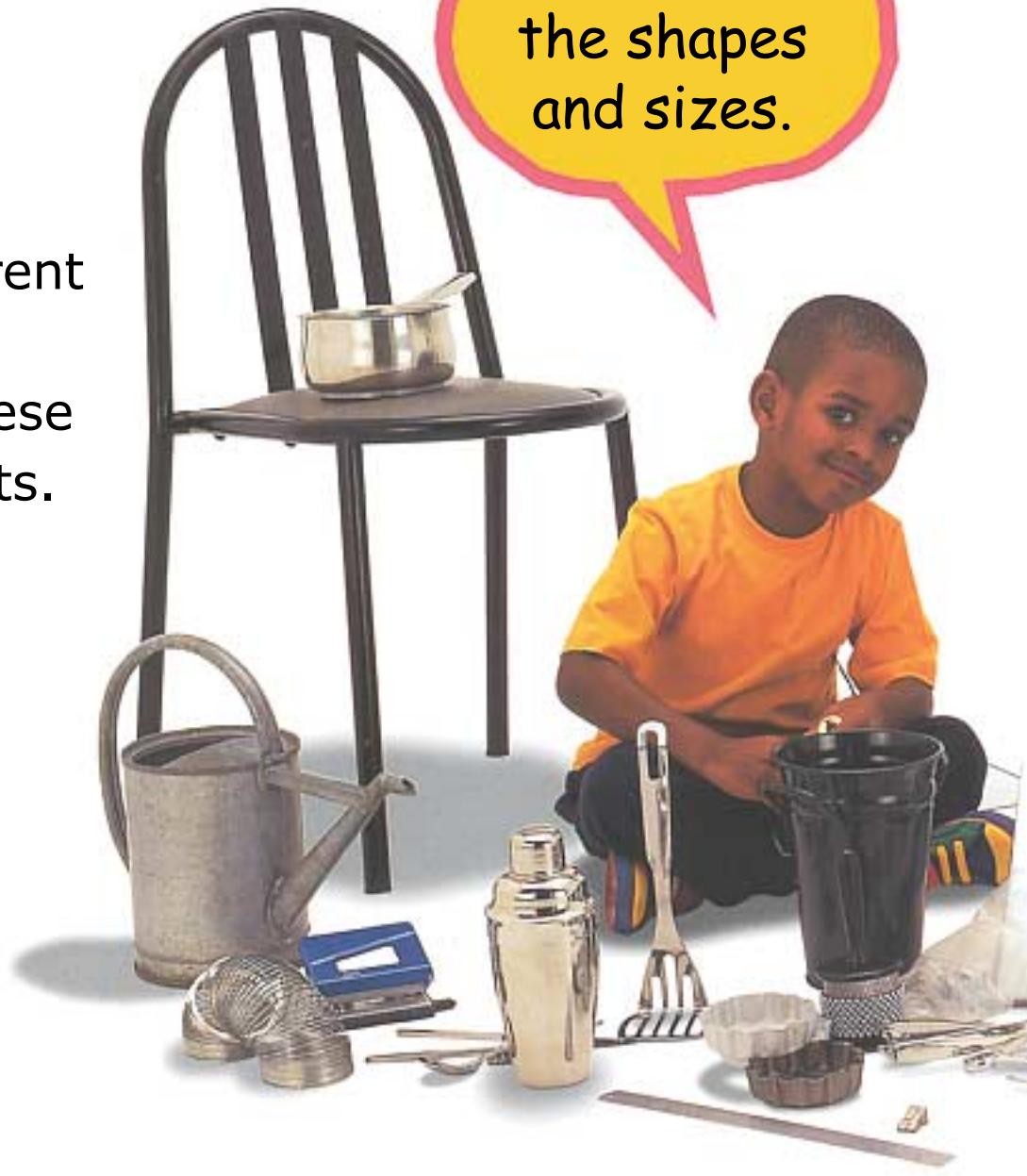


Nicola Edwards and  
Jane Harris

Photographs by  
Julian Cornish-Trestail

Metals have lots of different uses. We've collected these metal objects.

Look at all the shapes and sizes.



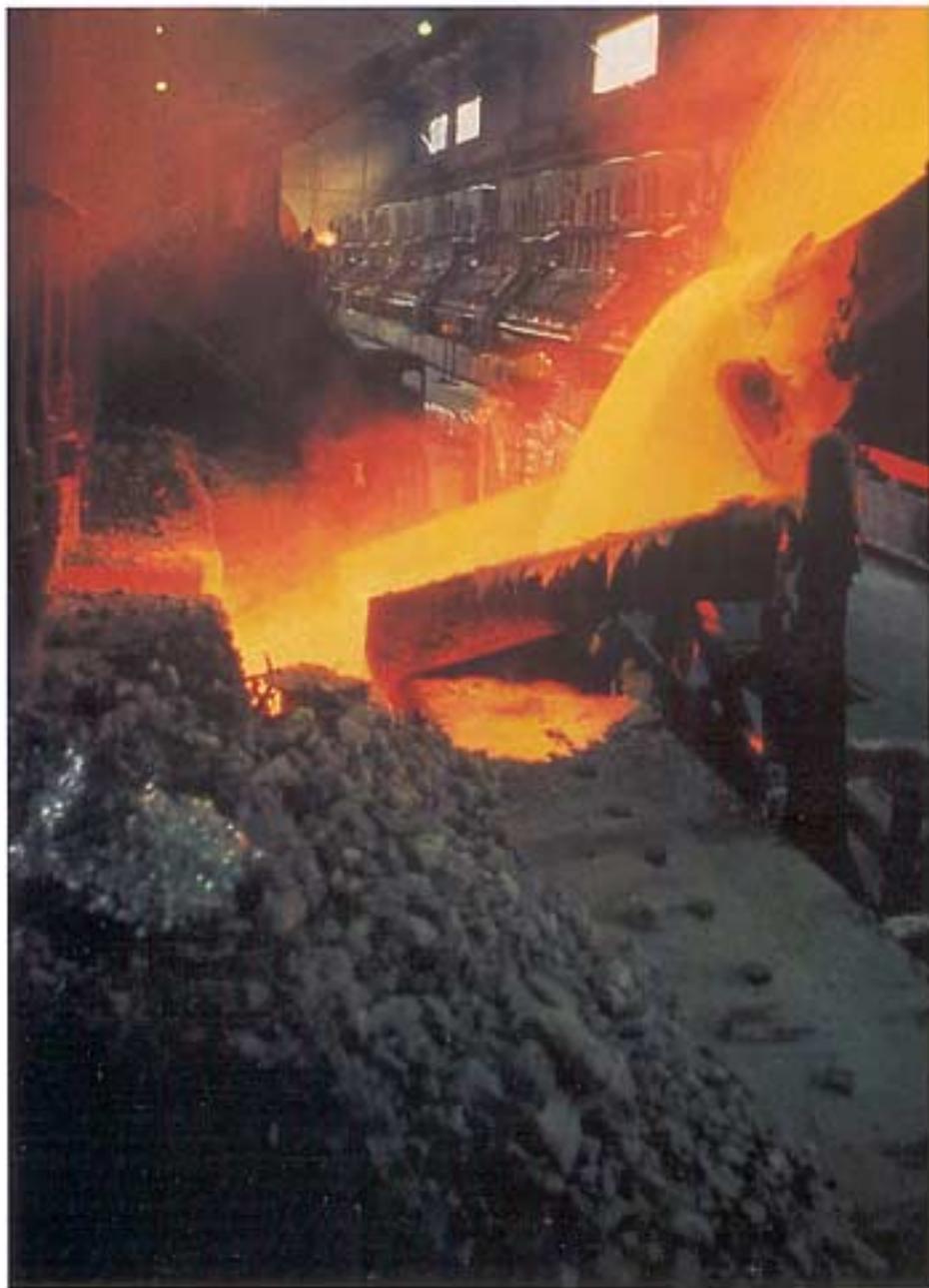


I've found  
some tiny  
objects.



Metals come from under the ground. Most metals are found in rocks, which are drilled out and crushed.



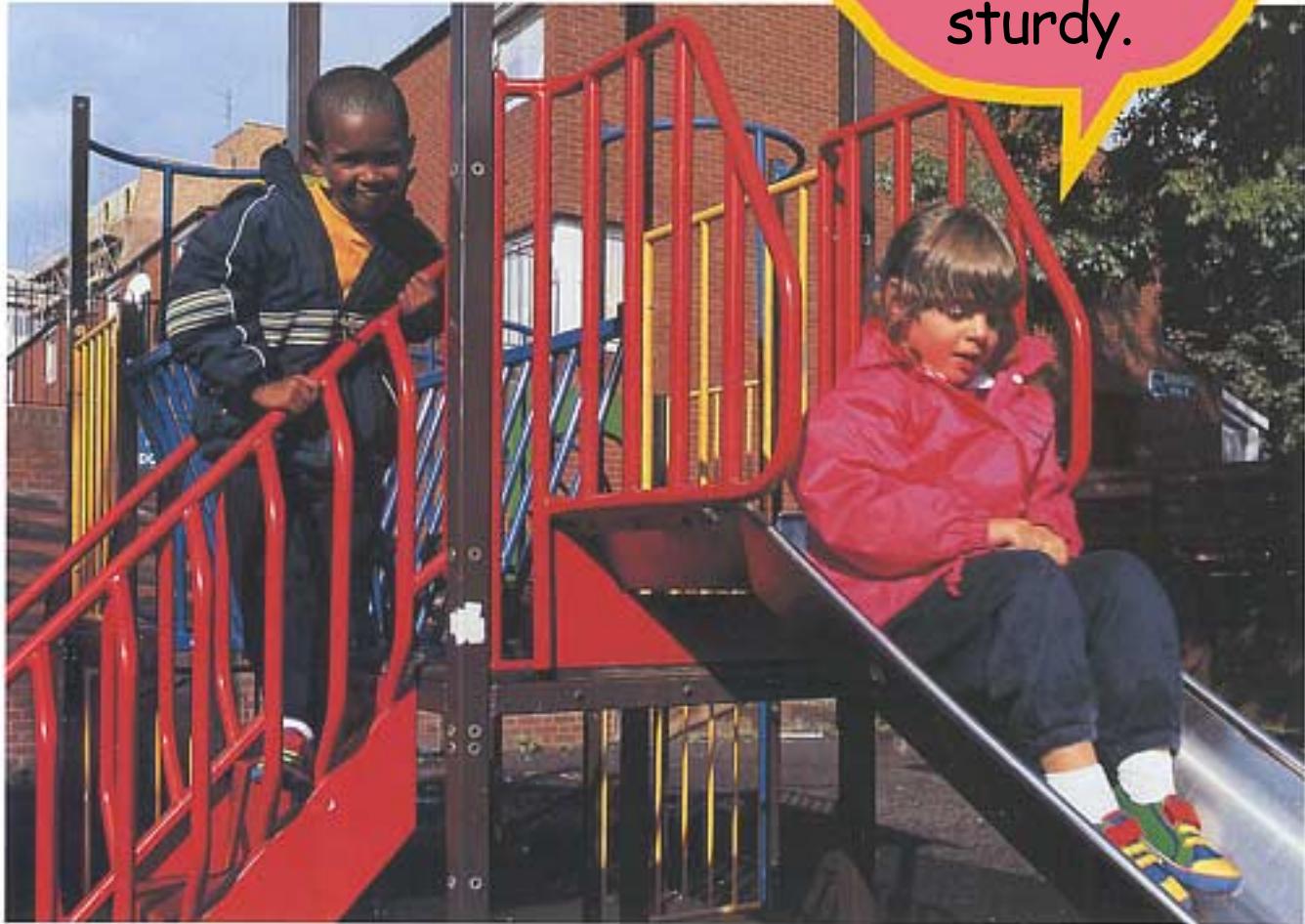


The rocks are heated to make the metal melt. When the metal cools, it turns into a solid block.



There are many different types of metal. Very strong metals are used to make bridges, boats and cranes.

This metal climbing frame is solid and sturdy.



Some metals are light and bendy.



I've bent  
this wire into  
star shapes.

I can't bend  
this metal.

My metal must be  
bendier than yours.

This metal saucepan is shiny and heavy. It has smooth surfaces so that it's easy to clean.



It feels cold and hard.

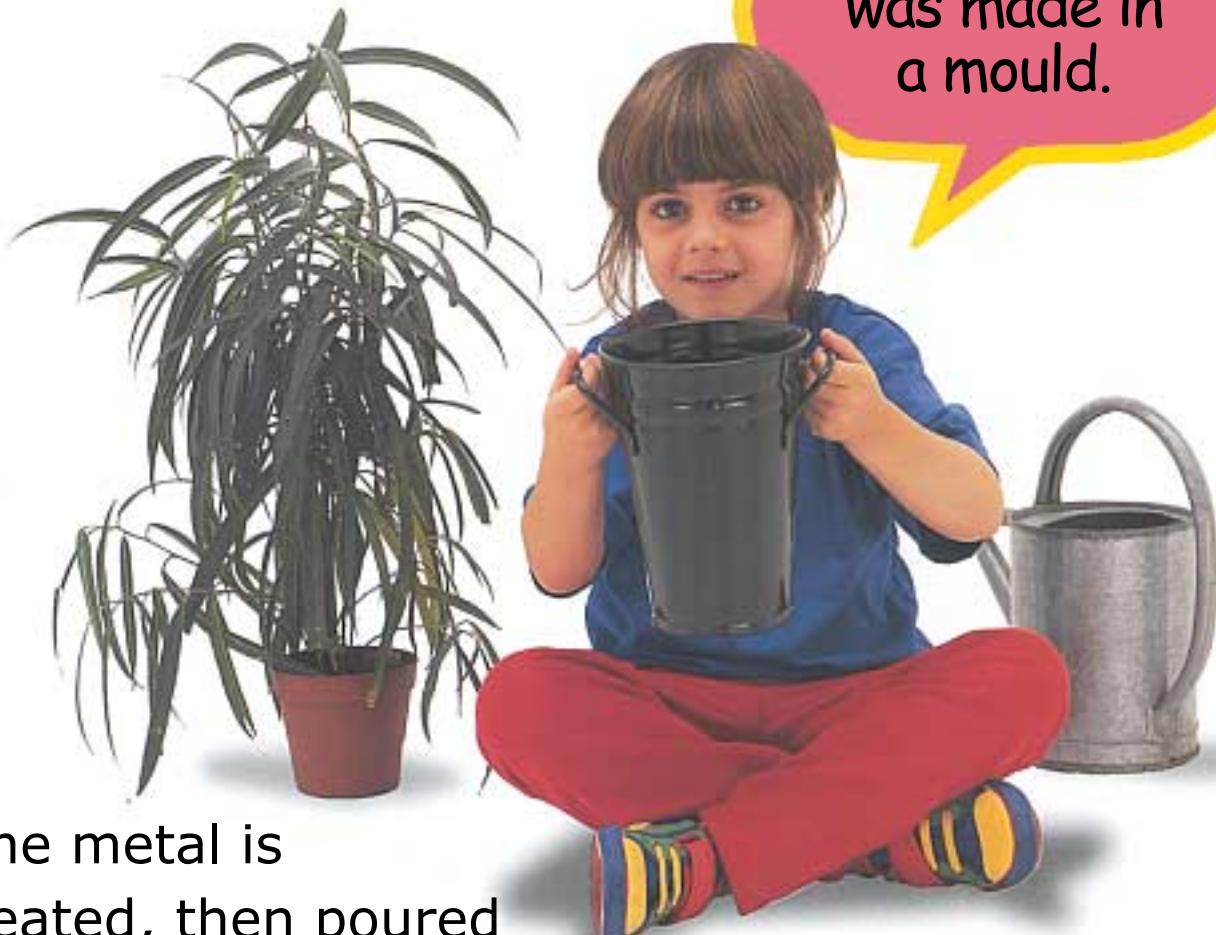
These metal scissors have a sharp edge.



This jumping ghost has a metal spring inside it.



Metals can be made into all kinds of shapes.



The metal is heated, then poured into a mould. As the metal cools down, it sets into the shape of the mould.

My box is made of flat pieces of metal.  
They have been bent into shape and  
joined together.

A young boy with short dark hair, wearing an orange t-shirt, is sitting on a yellow surface and holding a grey metal box. He is looking directly at the camera. A yellow speech bubble with a black outline is positioned to the right of his head, containing the text.

The box  
is light but  
strong.

Metal allows heat to travel through it.  
Let's find out if heat travels best through  
wood, plastic or metal.





The plastic spoon and the wooden spoon are still cold.

But the metal spoon is warm!

Iron and steel are magnetic. This means that a magnet will pull these metals towards it.

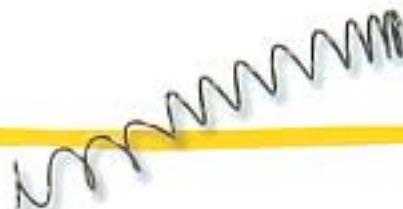


We're finding out which of these metal objects are magnetic.

Let's try the nail.



The magnet's lifting the nail. Look!





Some metals will  
rust if they are  
wet for a  
long time.

This trowel  
has been  
left outside.

The rain has  
made it turn brown  
and rusty.

Our cutlery is made of stainless steel.

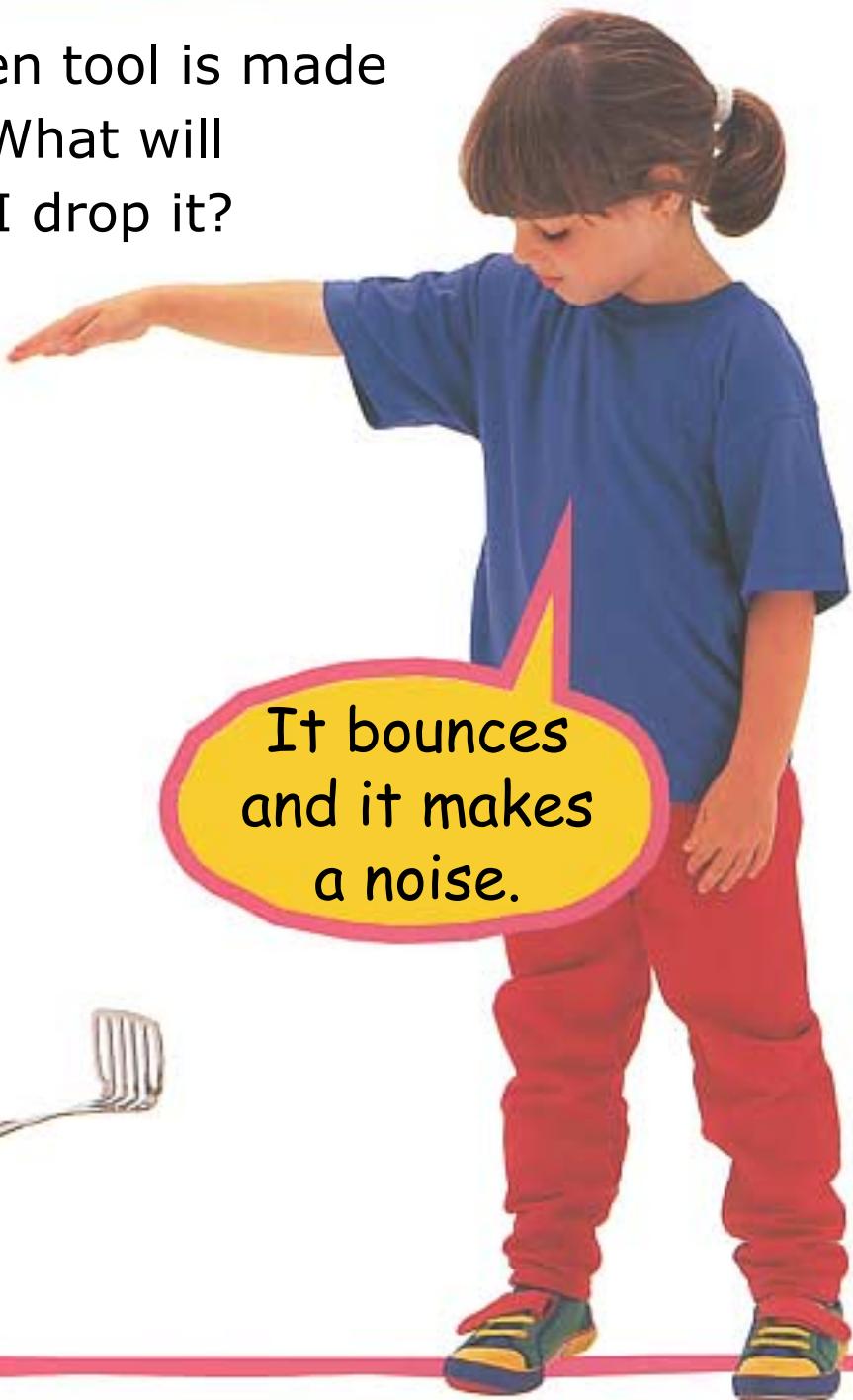


So we can wash it  
up again and again!

Other metals were added  
to the steel to stop it  
from rusting.



This kitchen tool is made of metal. What will happen if I drop it?





Some musical  
instruments are  
made of metal.

I'm going to  
clash these  
metal cymbals.

What a noise!

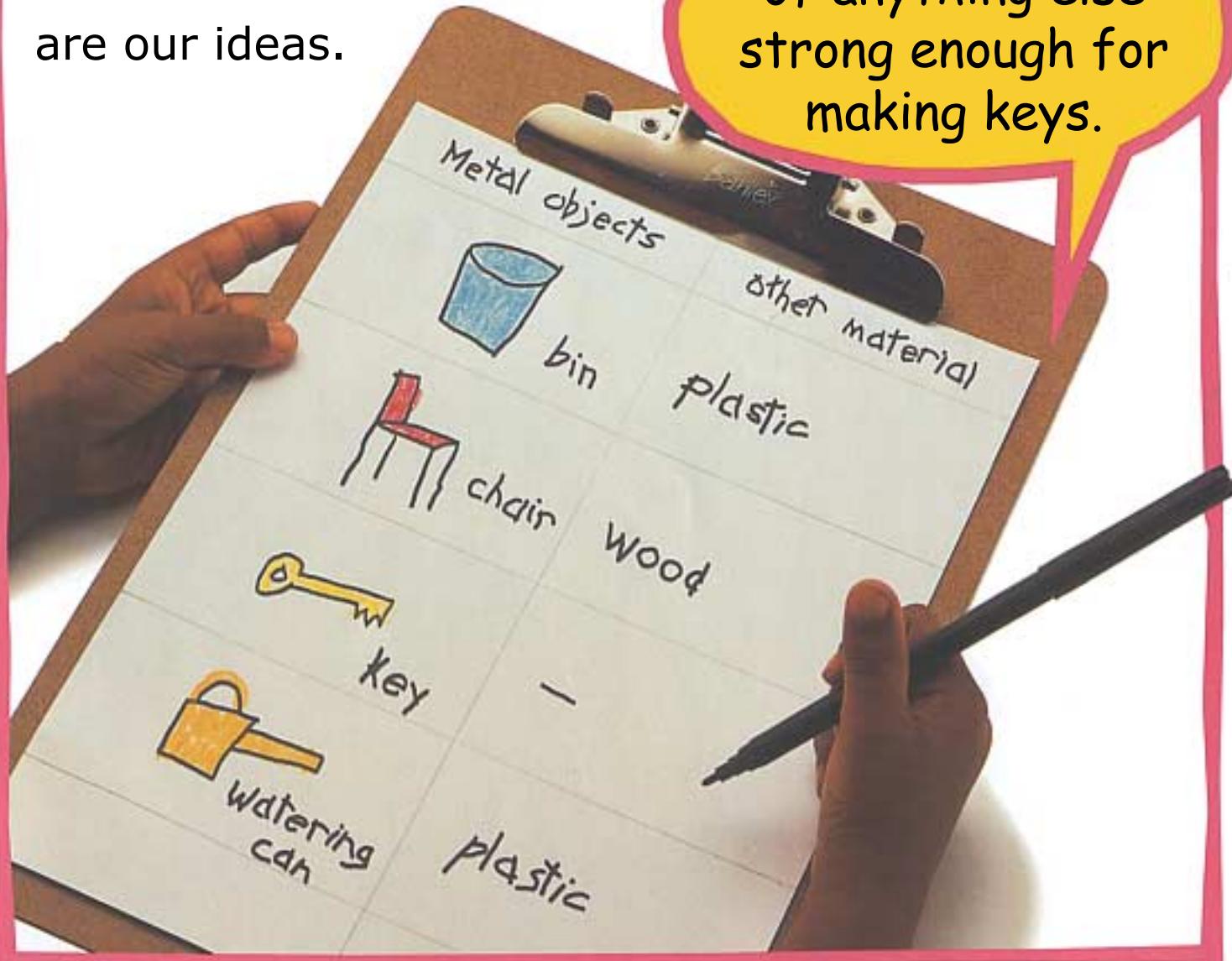
My hands  
feel tingly.



We've been for a walk  
around the school to  
look for metal objects.  
We've made a list.

I wonder if any of the objects could be made from other materials. These are our ideas.

I can't think of anything else strong enough for making keys.

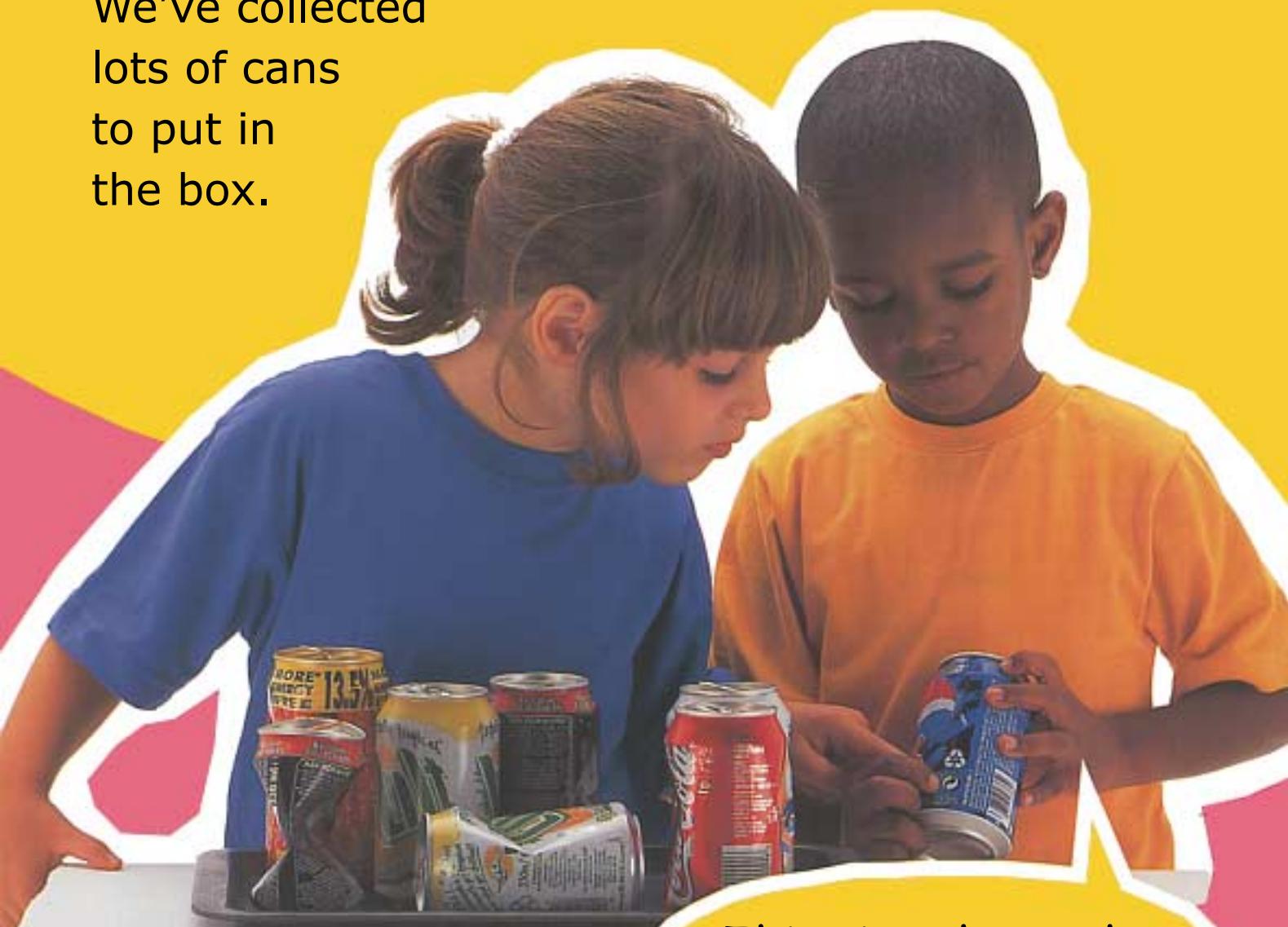


It's time to tidy away. Many metal objects can be recycled and made into new things.



We've made this recycling box for our school.

We've collected  
lots of cans  
to put in  
the box.



This sign shows that  
it can be recycled.

# Notes for parents and teachers

The aim of the *Science Explorers* series is to introduce children to ways of observing and classifying materials, so that they can discover the various properties which make them suitable for a range of uses. By talking about what they already know about materials from their everyday use of different objects, the children will gain confidence in making predictions about how a material will behave in different circumstances. Through their explorations, the children will be able to try out their ideas in a fair test.



## pp 2–3

There are more than a hundred known elements, from which everything in the world is made. More than three quarters of these elements are metals. While each metal has certain properties that distinguish it, all metals have a number of things in common. They all reflect light, are shiny in appearance and are good conductors of heat and electricity. All metals are silver or grey in colour apart from copper which is reddish, and gold which is yellow. Metals play a huge part in our everyday lives and they have done so for thousands of years. As early as 3,500 BC, gold was used for making ornaments, jewellery and utensils.

## pp 4–5

Only copper, gold, silver and platinum can be found as pure metals. Other metals are found in rocks called ores and are usually combined with other substances. Some metals, including iron and copper, are purified by smelting – the ore is crushed and heated in a furnace so that the hot liquid metal can be extracted.

## pp 6–9

Each metal has different properties which makes it useful for particular things. For example, tungsten is

used for filaments in light bulbs because it does not melt until heated to 3,400°C. Aluminium is very light and is used to make aircraft, boats and cars. It can also be rolled into very thin sheets and is used to make metal foil and drinks cans. The children could explore the different properties of a variety of metal objects, investigating weight, pliability and magnetism. Are the objects smooth or sharp; are they springy or solid; do they chip or crack if dropped?

## pp 10–11

Most metals can only be shaped when they are heated. This is done in different ways, such as casting, rolling or extrusion. Metal pieces can be joined using nuts and bolts or by more permanent methods, including welding, soldering or riveting. Look at some everyday metal objects and discuss how the pieces have been joined together.

## pp 12–13

Metals are good conductors of heat; the atoms are tightly packed together so that the vibrations are quickly passed on through the object. As an extension of the test on page 12, provide a variety of utensils that are made of metal but have plastic or wooden

handles. Ask the children to predict what will happen when they are placed in the jug. If possible, use a plastic jug (if the children handle glass, ensure that they are properly supervised).

#### **pp 14–15**

Iron, nickel and cobalt are the only pure metals that have strong magnetic properties. Children could explore magnetism further using a magnet to manoeuvre paper-clips on a piece of paper.

#### **pp 16–17**

Over time, many metals will corrode and weaken. Corrosion occurs due to the chemical action of a gas or liquid on the metal. Rust is the most common form of corrosion and affects objects made from iron or steel when they are exposed to moist air. Stainless steel contains nickel and chromium and resists rusting.

#### **pp 18–19**

Most metals are solid and hard at room temperature and will not crack or break if dropped. When a metal object is struck or dropped, it vibrates, causing it to make a sound. Percussion instruments in particular tend to be made of metal. The children could make their own percussion instruments, using metal objects.

#### **pp 20–21**

Encourage the children to imagine a world without metals. What substances are there which could replace metals? Did the children know, for example, that keys were once made out of wood?

#### **pp 22–23**

Recycling metals saves energy and reduces pollution. Discuss the importance of recycling and, if possible, take the children to a recycling centre that collects metal objects.

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